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AUTHOR Silverston, Randall A.
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ABSTRACT

Learning can be viewed as either a product or a process. The product view suggests that learning is the result of precise manipulations on the part of an instructor. The process position emphasizes that learning originates in the learner as a result of his or her mental and physical manipulations. These two philosophical vantage points have resulted in different forms of research and different forms of teaching practice. This paper discusses two lines of research--mathemagenic effects and cognitive style--which are of import to the reading educator and which are derived from the philosophical positions described above. This discussion provides a basis for describing those factors relevant to increasing the knowledge base concerning reading processes and predicts what reading instruction and reading disability remediation of the future might be like. (RB)

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WHAT MATHEMAGENIC EFFECTS AND COGNITIVE STYLES RESEARCH SHOULD MEAN TO THE READING EDUCATOR

Randall A. Silverston
University of Texas at Arlington

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College Reading Association

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Learning can be viewed as either a product or a process. The former view suggests that learning is the result of precise manipulations on the part of an instructor. The latter position emphasizes that learning originates in the learner as a result of his mental and physical manipulations. These two philosophical vantage points have resulted in different forms of research and different forms of teaching practice.

This paper shall discuss two lines of research, mathemagenic effects and cognitive style, which are of import to the reading educator and which are derived from the philosophical positions described above. This discussion will provide a basis for describing those factors relevant to increasing the knowledge base concerning reading process and will predict what reading instruction and reading disability remediation of the future might be like.

Mathemagenic Effects

Mathemagenic activities are defined as behaviors which give birth to learning (17). Various studies have been concerned with the manipulation of text presentation, in terms of mathemagenic effects, on learning outcomes. Several investigators (1, 4, 5, 18) have reported that the insertion of questions before and after prose material has certain effects upon intended and incidental learning. These studies indicate that questions inserted after prose passages facilitate both intended and incidental learning while questions placed before passages facilitate intended learning only. The

conclusion has, therefore, been drawn that "prequestions" sensitize or focus the attention of the individual to specific features of the text. "Postquestions" are seen as promoting attention to the text as a whole. In other words, questions presented before or after prose material are seen as mathemagenic.

More recent studies concerning mathemagenic effects have been concerned with individual learner differences. Shavelson, et. al (19) investigated the possibility that different question types (high order or low order) and question location in text interact with various aptitude measures in terms of comprehension and retention indices. One such aptitude measure, an advanced vocabulary test, did interact significantly with treatments. This study indicates that people scoring below a certain score on the vocabulary test should receive higher order questions after the text and that above a certain score either no question insertion or lower-order question placement after the text conditions are appropriate for overall retention.

Koran and Koran (12) and Hiller (8) also investigated variables which were hypothesized to be interactive with mathemagenic effects in text. Koran and Koran concluded that both vocabulary knowledge and associative memory were related to incidental learning but not to intended learning from texts. Hiller's study indicated that readability and question type (high and low level) interacted to the extent that all types of questions interferred with learning from a selection with a low readability score and high level questions interferred with learning from an average readability text. Anxiety and self-confidence measures were also found to be related to learning and retention from low readability passages.

Although mathemagenic effects conceptions are probably viable in the

study of reading comprehension and retention, individual differences, in terms of aptitude and affect, may also be inherent considerations in the presentation of text. More research into the relationships between these factors could result in more effective instruction and more effective learning.

Cognitive Style

Kagan, et. al. (10) defined cognitive style as "stable individual preferences in modes of perceptual organization and conceptual categorization of the external environment." He categorized these preferences into four cognitive style types (9) -- impulsive, reflective, analytic, and thematic. Impulsive thinkers have a fast conceptual tempo. They are concerned with giving quick responses. Reflective thinkers take time to thoroughly evaluate situations or problems before responding. People who discriminate the various parts of a complex situation are termed analytic thinkers. Individuals who constantly view complex situations from a wholistic perspective are classified as thematic thinkers. Messick (13) and others have described several other cognitive style categories.

Many investigators have attempted to ascertain the relationships between cognitive style and academic performance (6, 7, 10, 13, 14, 20, 21). Few conclusive results have been reported and many studies have been confounded by instrumentation difficulties (2, 3, 11).

The most promising investigation conducted recently was undertaken by Robinson and Gray (16). They determined that, when verbal and nonverbal IQ were taken into account, certain cognitive style categorizations (categorical, descriptive, and relational) were significantly related to specific academic skills (e. g. vocabulary, reading comprehension, spelling, language usage, mathematical concepts).

As with mathemagenic effects, significant breakthroughs in cognitive

style research which could have an impact on educational practice will probably result from analyses of interactive variables. The interactions between such variables as verbal aptitude, performance aptitude, attitudes, mathemagenic presentations, and cognitive style could provide the insights needed for such instructional innovations.

Reading Instruction: Current Considerations and Future Perspectives

The research areas covered by investigators of mathemagenic effects and cognitive style comprise very important considerations for reading educators. Empirical investigations will probably shed some light on the currently hazy area of reading comprehension.

Until such time when we are more certain and more aware about the relationships between variables involved in the reading process, certain considerations for reading instruction practice should be heeded. More emphasis should be given to the following in providing more individualized reading instruction: 1. How is the particular reading material being presented? Is it appropriate for the individual's level of sophistication? 2. Are there any factors which interfere with the learning of specific subject matter (e. g. repression, anxiety, inhibition)? 3. How motivated is the individual regarding the subject matter or reading in general? 4. What form of motivation is largely responsible for the individual's attitudial state in performing reading-related tasks? 5. How familiar is the student with the material to be read? 6. What is the student's cognitive style and what types of textual presentations would be more mathemagenic on this basis? These questions cannot currently be answered in a very organized, objective way. Observation of such things as notetaking, underlining in text, etc. and verbal reports from the student in an interview format, however, can provide clues and insights into such factors.

It is possible to foresee that some day reading instruction will be so exacting that each student might have an instructional program that will be uniquely his. The basis for such a system may indeed come from research into mathemagenic effects and cognitive style. If this is the case, the system would resemble what is presented in Figure 1. Basic screening in neurological, perceptual, and decoding skills would precede all other diagnostics. Compensatory education for any physical impairment or basic skill deficiency could then be undertaken. Diagnostics would then be performed in the general areas of accomodation and assimilation.

Piaget (15) sees accomodation and assimilation as interacting factors which underly intellectual development. Accomodation is the inclination or orientation to information or events. Assimilation is the internalization or ordering of experiential events. Thus, presentation of material (readability, format, size of print, use of graphs, pictures, formulas, etc.), psychological factors (repression, inhibition, etc.), familiarity with subject matter, motivation type (e. g. extrinsic, intrinsic, avoiding consequences, or to make gains), and motivation level (arousal) would all involve orientation on the part of the student and can be classified as accomodation factors. Cognitive style (i. e. impulsive, reflective, analytic, thematic, etc.) and mathemagenic presentation (cues, elaboration, contiguity, imagery) are concerned with how a student organizes his thoughts and can be categorized as assimilation factors.

On the basis of accomodation and assimilation diagnostics reading instruction would be along psychological, social, and skill-based dimensions and would be geared to fit individual needs. Appropriate instruction would be provided for the appropriate individual.

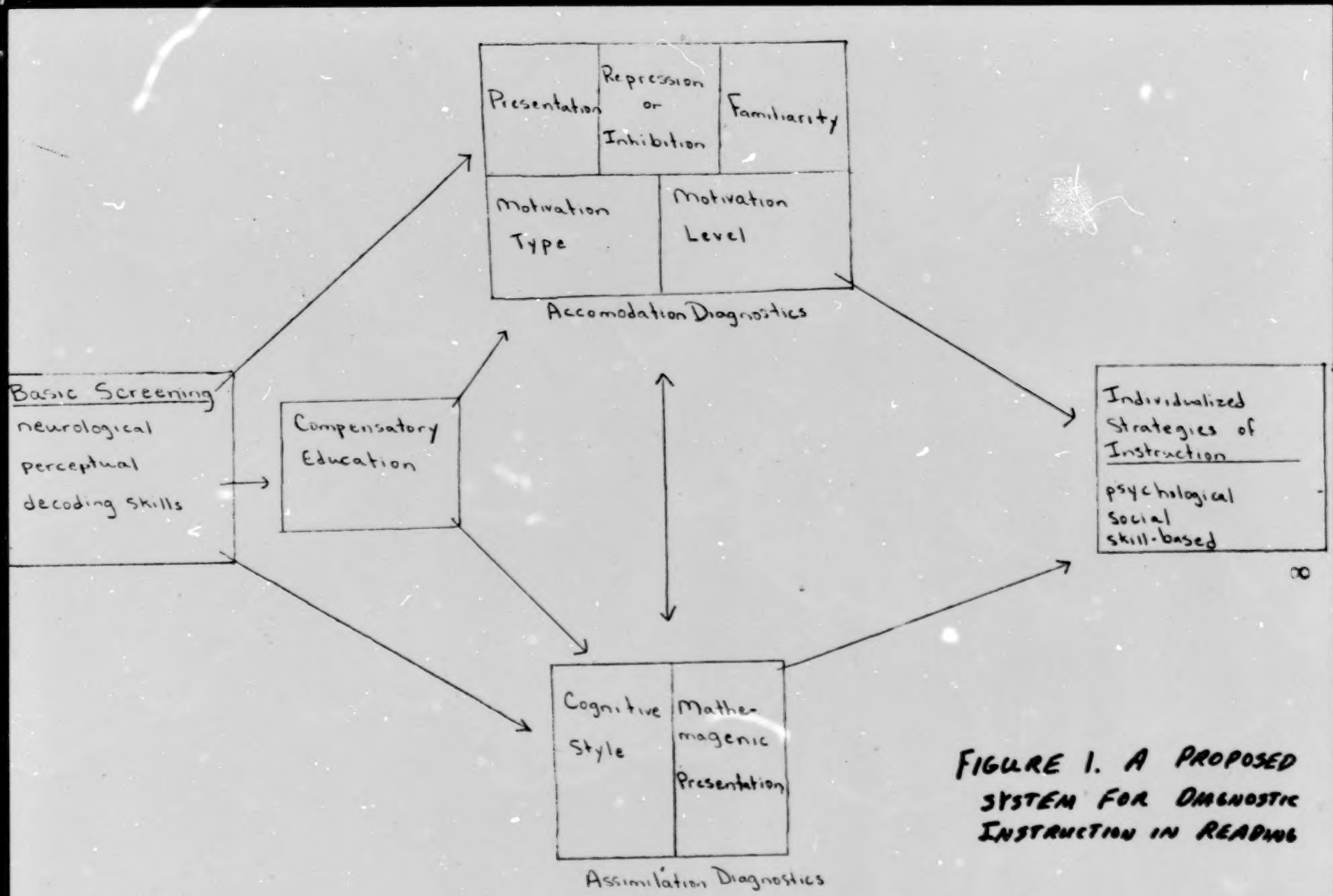

FIGURE 1. A PROPOSED SYSTEM FOR DIAGNOSTIC INSTRUCTION IN READING

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